
CRISIS RESPONSE
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JOURNAL
CRJ IS TEN YEARS OLD
A decade of exploring crisis response lifelines
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Interview: Sir David King
Smart, resilient cities
Future technology

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WE ARE ENTERING our tenth volume of *CRJ*, which was launched a decade ago. The nature of the publication means celebration is inappropriate; too many incidents have occurred over this time, too many lives lost. But it is, nonetheless, a gratifying milestone.

Our founding ethos still holds true: to bridge any institutional, organisational and national gaps, to share information, enhance partnership working and improve communication. It has been good to see how dialogue between various disciplines and organisations has evolved, as shown by the increasing diversity of actors and stakeholders who have become involved in the conversation through our pages.

Despite this, in many ways the world feels no safer. The Hydra of wicked problems sometimes appears invincible, the same incidents repeating themselves, locked in a dispiritingly familiar cycle. Each time we absorb the horror of a disaster or terrorist attack, a bigger, more destructive one seems to surpass it.

The risk landscape has shifted in a decade: climate change has been added to the list of threats, exacerbating existing hazards. But the response, resilience and emergency planning community has developed accordingly in terms of leadership acuity, interagency co-operation, mutual assistance and business continuity.

And it is fascinating to observe the proliferation of emerging technology – ten years ago we hadn't heard of Twitter, YouTube, the Internet of Things, smart cities… Of course, these bring their own vulnerabilities and can be exploited to cause harm, but their potential for improving safety and resilience should not be overlooked.

So is with gratitude that we thank our sponsors, many of whom helped to launch *CRJ* ten years ago. Thanks also to our Editorial Advisory Panel – those who have been with us since the start and those who joined us along the way – and to the writers who have generously shared their thoughts, knowledge and experience. And an immense thank you to our subscribers.

To paraphrase Camus, most people are good rather than bad; it is usually ignorance that causes harm, despite good intentions. And this is why sharing experience and information is so vital: you are all working to eradicate ignorance and make the world a safer place.

It is a privilege to observe and report on this.

Emily Hough

CRJ's Sponsoring Partners are leading specialists in the crisis, security and emergency response disciplines

Earth observation

The potential contribution of space-based information to disaster risk management is not being fully exploited, and what information is available is rarely easily accessible for disaster risk managers, explain **Antje Hecheltjen** and **Anne Pustina**

Restricted budgets and a lack of qualified personnel mean that there are still gaps with regards to general awareness of how useful satellite information, data and capacities can be in risk management. UN-SPIDER is working hard to raise awareness in this field

Droughts and floods can have a massive impact for populations in terms of livelihoods, food and water security, physical security or sustainable development. Hydrometeorological events affect many countries around the world and create massive damage, as recent examples show. These include floods in: Central Europe, June 2013; the UK, February 2014; the Balkans, May 2014 (see p81); and following super typhoon Haiyan in the Philippines in November 2013. They also include drought, such as that experienced in Eastern Africa in 2011 and Bolivia in 2013.

Effective disaster risk management helps to prevent natural hazards like these from turning into disasters. Space technologies, especially Earth observation and global navigation satellite systems, provide information that can be used for a more effective risk assessment.

The potential contribution of space-based information to disaster risk management is, however, not yet fully exploited – technical solutions are not sufficiently tailored to assess hazards and the exposure of elements vulnerable to them, nor is this information easily accessible for disaster risk managers.

Researchers, practitioners, disaster risk managers and space technology experts from all over the world must work together to find solutions to tackle the risks associated with floods, droughts and other natural hazards that threaten countries and regions all over the globe and which do not stop at national borders.

The United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER), which is a programme implemented by the United Nations Office for Outer Space Affairs (UNOOSA), organised an Expert Meeting on Space Technologies for Drought and Flood Risk Reduction in Bonn, Germany, earlier this year. The event brought together nearly 60 international experts from various national and international organisations from Africa, Asia, Latin America, Europe and North America. Twelve keynote and plenary presentations and several working groups allowed the experts to exchange and discuss various approaches and methods in depth.

In contrast to disaster response efforts, which are reactive, risk management focuses on ways to assess risks before they turn into disasters, so as to minimise their effects. The goal was to exchange information and experiences on the most up-to-date satellite technologies, including Earth observation, to enable countries to assess and reduce risks of both floods and droughts more successfully.

Hazard assessment

During the meeting, experts discussed how satellite technologies can generally contribute to the assessment of flood and drought hazards, exposure, and vulnerability and how to use such technologies to track changes in the level of risk over time. One of the sessions of the meeting was also dedicated to identifying elements to contribute to the Post 2015 framework for disaster risk reduction (*HFA-2*) and to the upcoming World Conference on Disaster Risk Reduction in Sendai, Japan, in March 2015.

Disaster risk is worked out by combining information on hazards, along with exposure of vulnerable elements or assets and their degree of vulnerability. Space technologies can contribute to assessing hazards and exposure, and are particularly useful in tracking how these change over time, owing to development trends in countries around the world. Taking a birds-eye perspective, satellites can be used to detect, map, monitor and visualise indicators relevant to risk analysis on a global scale. These include indicators related to infrastructure and land use (topography, urbanisation trends, transportation networks, types of crops, deforestation), along with atmospheric and environmental variables (soil moisture, precipitation, temperature). Satellites offer an unparalleled opportunity to track and assess the extent of changes over time caused by both planned development and unforeseen crises.

Global multi-hazard maps are already available, but the more precise identification of high-risk areas is still an ongoing activity. A key parameter that can be assessed using satellite imagery is the exposure of vulnerable elements. Earth observation can quantify the number of vulnerable elements or assets within a specific geographic area and which are exposed to a particular hazard.

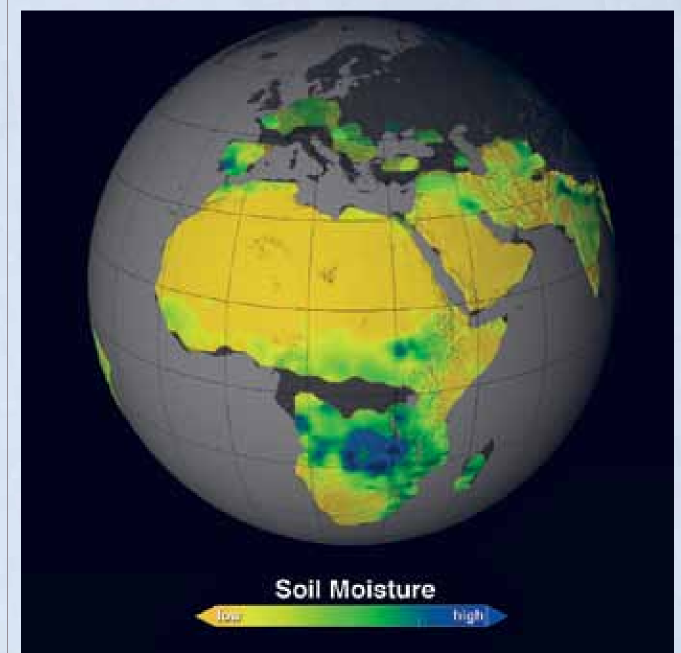
However, vulnerability assessment requires socioeconomic data, which needs to be assessed on the ground.

Overall, hazard, vulnerability and risk assessments are complex tasks, which usually require a combination of different satellite data sets, including low and high resolution imagery, optical and Synthetic Aperture Radar data in combination with ancillary ground-based or airborne data.

Flood risk reduction is achieved through several ways, including through the incorporation of strong land-use planning regulations to reduce the number of vulnerable assets or exposed elements. Furthermore, it includes reducing the degree of vulnerability of these elements or assets and the incorporation of physical measures, such as levees, as a way to control the extent of floods in particular geographic regions. Satellite data can support these efforts through the provision of reliable and precise data to national authorities, civil protection agencies or communities.

For example, satellite-derived flood masks from historic or recent floods can be used in flood hazard management. However, they need to be complemented by a thorough hazard assessment, including probabilities of flood events. Digital Elevation Models (DEMs) generated through satellite data have the potential to estimate flood depth, but the available data is not yet precise enough to create reliable models, as small errors in the DEM will lead to large errors in the depth estimation. The assessment of changes in land-use and land-cover over time using Earth observation methods can supply data for hydrological and hydraulic models to help track how processes such as urbanisation are affecting spatial and temporal flood behaviour.

Earth observation mapping



Opposite: Arctic melt pond atop a glacier in south-eastern Alaska, July 2014. Above: Soil moisture conditions in August 2013; such data can help to develop drought vulnerability maps.

MABEL | NASA's Goddard Science Visualisation Studio

Earth observations are unique in allowing international or regional organisations and governments to identify key hot spots around the world where drought may affect agriculture or livestock. Satellite imagery can be used to track changes in soil moisture and to assess the effects of droughts.

Several indicators have been developed to combine the use of archived and up-to-date imagery as a way to contribute to drought early warning systems by monitoring vegetation health and soil moisture. Ministries of Agriculture and food security organisations can use Earth observation techniques to map the geographical extent of specific crops and develop drought vulnerability maps. This, of course, requires solid databases on specific crops and their vulnerability to droughts, as well as access to high resolution imagery. On the basis of such maps, more drought-resistant crops could be planted in areas identified as being prone to drought, thus reducing vulnerability and enhancing food security.

As space technologies can provide relevant data to monitor changes on a large scale and with unique precision, UN-SPIDER strongly promotes the explicit incorporation of these technologies in internationally recognised frameworks on disaster risk reduction and sustainable development, which will emerge in 2015. Efforts to reduce disaster risks and to achieve sustainable development worldwide can be periodically reviewed and monitored using satellite information.

With geospatial and space-based information, decision-makers are better able to monitor indicators relevant to risk analysis on a global scale. Space technologies can contribute towards mapping the uneven distribution of risk across national borders in an objective way. They can be used in geographic areas where no ground-based measurements are available. And with the capacity to access more than three decades of archived imagery, decision-makers can track changes in the level of risks of communities worldwide.

Today, there are still gaps with regard to awareness on the usefulness of satellite information, access to the data and products and the capacities to fully benefit from them, owing to issues such as restricted budgets or a lack of qualified personnel. It is for this reason that UN-SPIDER conducts expert meetings, workshops, technical advisory missions and other events worldwide. These events promote the value of space-based information and the recognition that this information can avoid risks turning into disasters. CRJ

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